From Jellyfish and Wind Turbines to Genomics: Dealing with Data Extremes in Complex Systems

John O. Dabiri, Stanford University

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Kane 220

Our ability to predict important phenomena such as ocean climate change, cardiovascular health, or the performance of a jet engine requires a set of mathematical tools to describe complex fluid dynamics. In practice, we're often faced with a Goldilocks problem: we have either too much data arising from observations of those flows or too little data. In this talk we'll explore new tools from Lagrangian fluid dynamics, differential calculus, and graph theory that allow us to navigate both data extremes and ultimately to optimize important flow physics. As a bonus, we'll discover how similar ideas can be exploited to study biological data arising in fields like genomics and neuroscience.

John Dabiri is Professor of Civil & Environmental Engineering and of Mechanical Engineering at Stanford University. His research focuses on science and technology at the intersection of fluid mechanics, energy and environment, and biology. Honors for this work include a MacArthur Fellowship, an Office of Naval Research Young Investigator Award, and a Presidential Early Career Award for Scientists and Engineers (PECASE). Popular Science magazine named him one of its “Brilliant 10” scientists for his research in bio-inspired propulsion. For his research in bio-inspired wind energy, Bloomberg Businessweek magazine listed him among its Technology Innovators, and MIT Technology Review magazine named him one of its 35 innovators under 35. In 2014, he was elected a Fellow of the American Physical Society, and in 2018 he won the Eugene L. Grant...
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